Tea Timer

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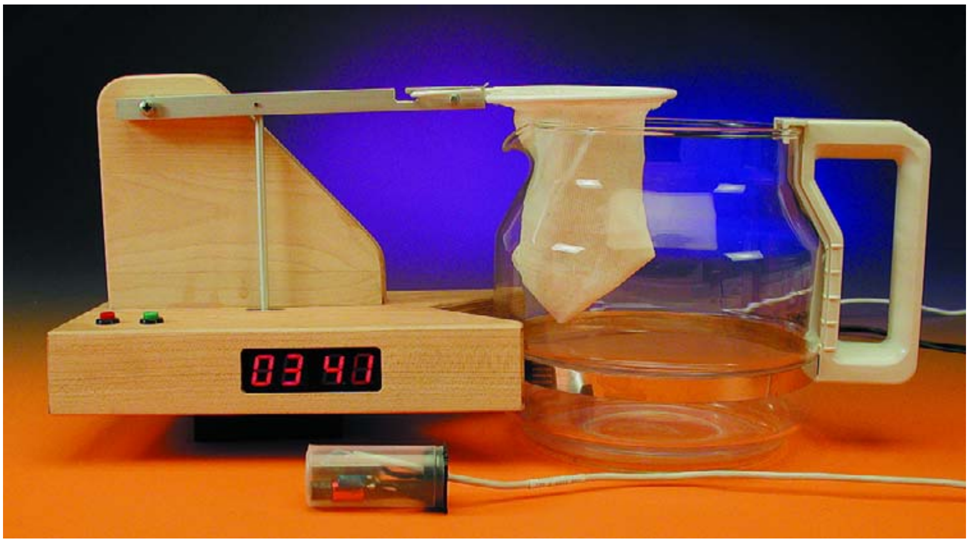
T. Finke



Tea drinkers take note: you are about to see the ultimate device for lifting the tea egg out of the teapot, complete with a microcontroller and DCF (radio time standard) control. Every tea drinker is familiar with the problem: you pour water into the teapot and turn your attention to something else while the tea is steeping. Naturally, you forget about the tea, and when you finally remember it has long since become a bitter muck.

The Tea Timer solves this problem by independently lifting the tea strainer out of the teapot or cup after an adjustable interval. The time is provided by a DCF module, which also displays the exact time of day when no tea is being brewed. However, if you place a teacup next to the Tea Timer, its display changes to show how long the tea strainer should remain in the pot. This time can

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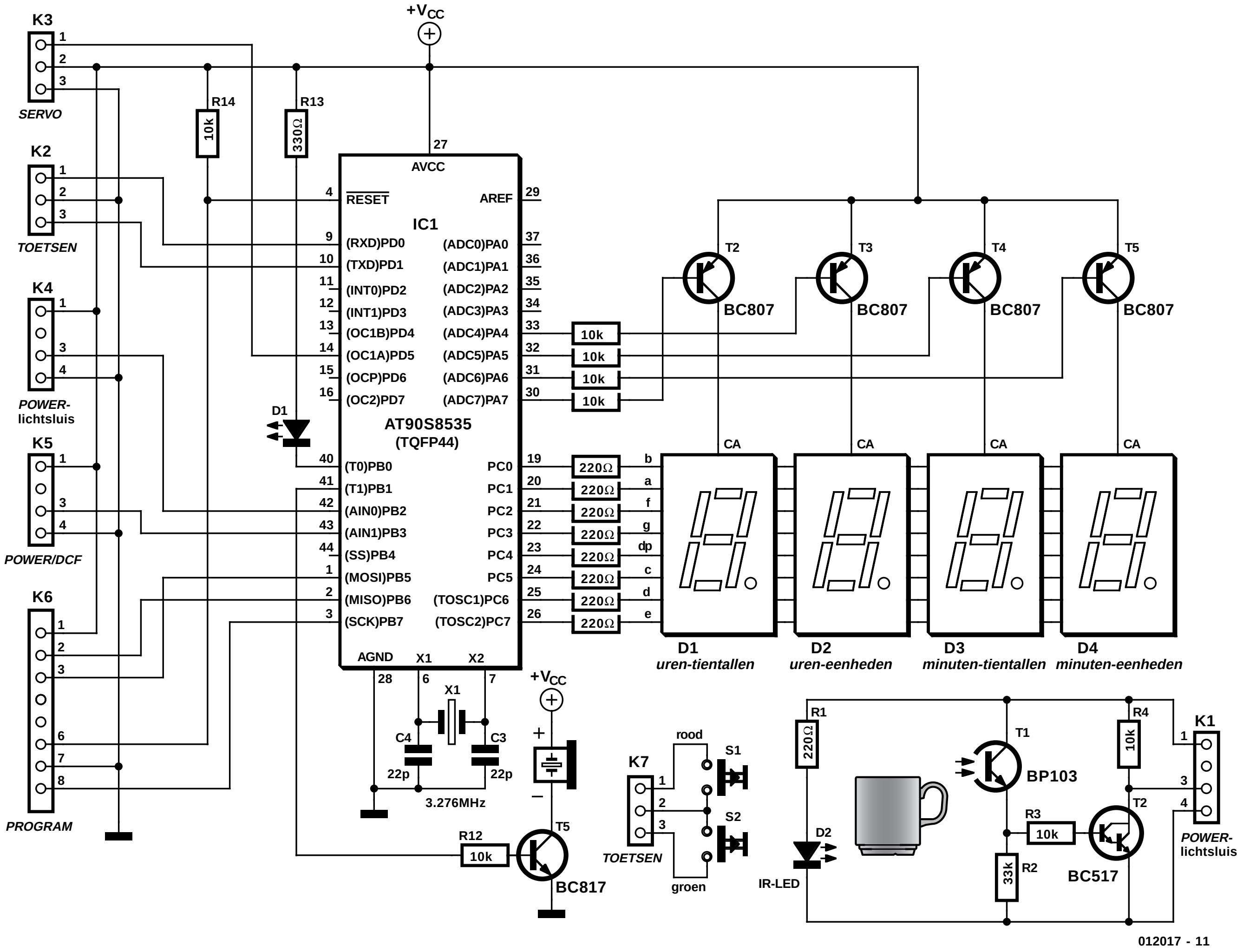
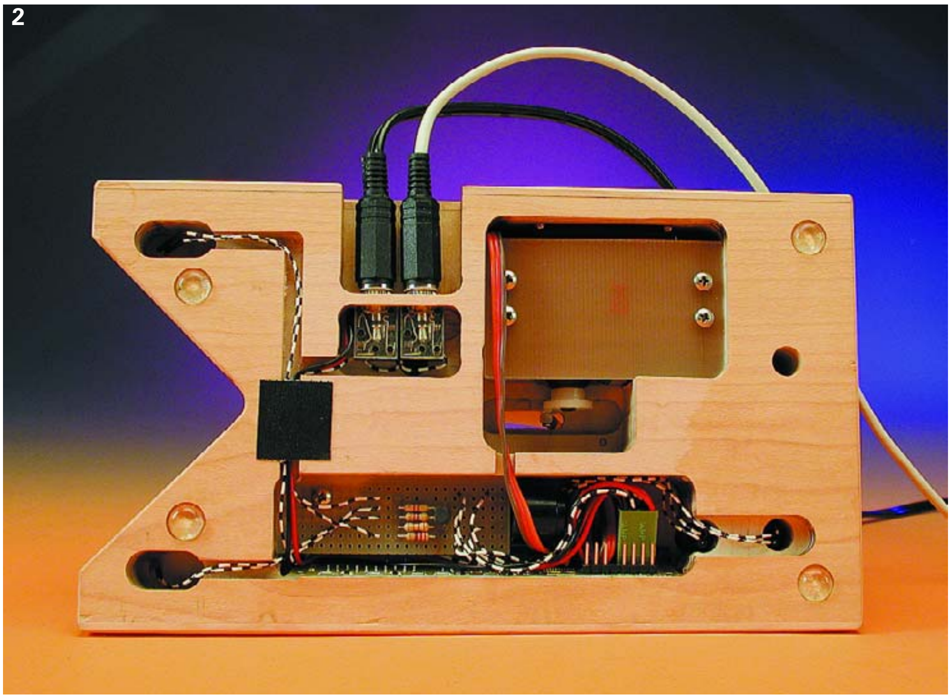


be adjusted whenever desired using a pushbutton. Next, you pour water into the pot and press the Start button. The remaining time is displayed, and when the counter reaches zero a servo lifts the teabag out of the tea. After a short pause – after all, the teabag has to drip off – a buzzer sounds to indicate that 'tea's on'.

A glance the circuit diagram in **Figure 1** shows that an AT90S8535 microcontroller (well known to regular *Elektor Electronics* readers) orchestrates the actions of the Tea Timer. The following devices are connected to its ports: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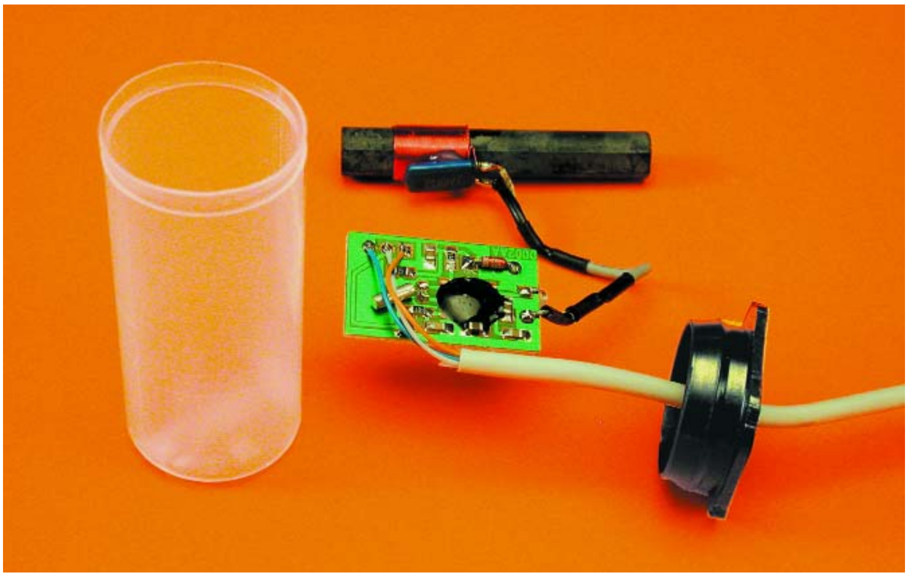
- Four multiplexed LED modules with driver transistors for displaying the remaining time (in minutes and seconds) and the time or date (in hours and minutes, minutes and seconds or day and month, selectable using a pushbutton).
- An R/C model servo connected to X3.
- An LED that blinks in sync with the DCF signal after power is applied so the antenna can be properly oriented and then remains on steadily.
- A light-barrier sensor consisting of an IR LED and a phototransistor (almost any IR type can be used), connected to X4.
- A DCF module connected to X5.
- Two pushbuttons connected to X2.
- A programming connector (X6).

If you look at the carefully routed-out bottom of the Tea Timer (**Figure 2**), you can see how the electronics are arranged. The light barrier sensor can be seen at the left, with the light barrier buffer being built on a small piece of prototyping board. The main circuit board (layout available from the *Elektor Electronics* website as a PDF file) with the microcontroller and the four seven-segment displays is fitted at right angles to the light barrier and can barely be seen here; only the programming connector (a pin header) protrudes. The two pushbuttons are fitted to the right of the main circuit board. The R/C servo, which moves the teabag up and down via the linkage, is secured in the large recess with the circuit board segment.

Finally we have the two external connectors (miniature stereo phone sockets) on the right: one is for the DCF module with its ferrite antenna, which is housed in a small, empty IC tin (visible in the foreground of the title picture), and to its left is the power connector. Any mains adaptor that can supply a well-stabilised 5 volts at 300 mA is suitable as a power source. However, additional stabilisation in the form of a fixed-voltage regulator can't do any harm and can certainly be fitted into the housing.



The microcontroller is programmed in C. Both the hex file (for directly programming the microcontroller) and the C source text are available in the Free Downloads section of the *Elektor Electronics* website. The definitions SERVO_O and SERVO_U at the beginning of the code (commented in German), which represent the angle settings of the servo for the 'arm up' and 'arm down' positions, respectively, may need to be adjusted in certain situations. Even if you don't have a compiler, these values can easily be modified in the hex code.

The DCF time standard transmitter can be received within a range of about 1,500 kilometres from Düsseldorf, Germany.

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